PROPOSED (8/03/04)

Covered Source Permit Review Summary

Application File No.:	0216-07 (Significant Modification)
Permit No.:	0216-06-C
Applicant:	City and County of Honolulu Department of Environmental Services
Facility Title:	Sand Island Wastewater Treatment Plant Located at 1350 Sand Island Parkway, Honolulu, Oahu UTM: 615,900 m E; 2,356,500 m N / NAD 83
Mailing Address:	City and County of Honolulu Department of Environmental Services 1000 Uluohia Street Kapolei, HI 96707
Responsible Official:	Mr. Frank J. Doyle Director Department of Environmental Services City and County of Honolulu Ph. (808) 692-5159
Plant Manager:	Mr. Allen Perry Plant Superintendent Ph. (808) 847-8329
Point of Contact:	Mr. Jim Morrow Environmental Management Consultant Ph. (808) 942-9096
Application Dates:	Significant Modification - March 5, 2003 and additional information dated June 3, 2003, August 12, 2003, November 21, 2003, December 8, 2003, January 9, 2004, January 27, 2004, January 31, 2004, April 14, 2004, April 20, 2004, May 12, 2004, July 11, 2004, July 12, 2004, July 14, 2004 and July 23, 2004.

Proposed Project:

SICC 4952

The City and County of Honolulu, Department of Environmental Services, is proposing to modify the existing Sand Island Wastewater Treatment Plant (WWTP) by the addition of a new In-Vessel Bioconversion Facility. The existing plant is permitted under Covered Source Permit (CSP) No. 0216-04-C and consists of the sludge incinerators, Cleaver Brooks boilers, effluent diesel engine pumps and odor control systems. Application nos. 0216-05 and 0216-07 propose to permanently shutdown and remove from service the existing sludge incinerators and permanently shutdown the Screenings Building Odor Control System prior to the startup of the In-Vessel Bioconversion Facility.

The In-Vessel Bioconversion Facility's purpose is to recycle Sand Island Wastewater Treatment Plant municipal sludge into a marketable fertilizer product. The facility is designed to process 10,000 dry tons per year of the Sand Island WWTP raw sludge. To do this, the facility will be using an anaerobic digester, dewatering centrifuges, and a sludge dryer capable of handling all of Sand Island WWTP's sludge. The anaerobic digester will reduce the volume of the sludge while producing digester gas that will provide fuel energy to the sludge dryer. The digested sludge will be dewatered and then dried into pellet form. The pellets will be marketed locally as fertilizer.

An application fee for a significant modification to a covered source of $1,000.00 was submitted and processed.

Equipment Description:

The In-Vessel Bioconversion Facility consists of the following major equipment:

1. Andritz DDS-40 Drying System
    a. Combustion Furnace
    b. Rotary Drum Dryer
    c. Regenerative Thermal Oxidizer (RTO)
    d. Wet Venturi Scrubber
2. Building Air Chemical Odor Control Scrubber
3. Two (2) Fugitive Dust Control Systems
4. Hot Water Boiler
5. Waste Gas Burner (Flare)
6. Gas Purifiers
7. Two (2) Pellet Storage Silos

Parameter	Combustion Furnace	Regenerative Thermal Oxidizer (RTO)	Hot Water Boiler	Waste Gas Burner (Flare)
Max Design Capacity	17.8 MMBtu/hr	2.0 MMBtu/hr	2.5 MMBtu/hr	8,000 scfh
Fuel Type	digester gas (diesel fuel no. 2 backup)	diesel fuel no. 2	digester gas (diesel fuel no. 2 backup)	unscrubbed digester gas
Max Fuel Use	32,364 scf/hr (127 gph)	14.3 gph	4,545 scf/hr (17.9 gph)	8,000 scfh
Raw Materials	scrubbed digester gas, diesel fuel no. 2	diesel fuel no. 2	scrubbed digester gas, diesel fuel no. 2	unscrubbed digester gas

Process Description:

Raw sludge undergoes anaerobic digestion in the 2.3 million gallon Egg-Shaped Digester (ESD). Gas generated during this digestion process is used for combustion. Digested sludge is transferred to a 0.53 million gallon sludge storage tank. From this tank the sludge is moved to centrifuges for dewatering and then to a wet cake bin. From this bin the digested, dewatered biosolids cake is transferred to a mixer where it is combined with material recycled from the pelletizing process. From the mixer, the material is conveyed to a rotary drum dryer where it is dried by direct heating. The heat is provided by a combustion furnace rated at 17.8 MMBtu/hr and is fired on scrubbed digester gas. Diesel fuel no. 2 is the backup fuel for the combustion furnace.

When drying is complete, the material is conveyed to a pre-separator, a poly-cyclone and then to a vibrating screen for further classification. The largest particles on the screen are transferred to a crusher and then to a mixer cited above where they are mixed with the incoming dewatered biosolids cake. The smallest particles passing the screen bypass the crusher and are also conveyed to the mixer. Particles, i.e., pellets, of acceptable size are transferred to a pellet cooler and then pneumatically conveyed to a storage silo. From this silo they are transferred to a pellet oiling mixer prior to truck loading.

Gas generated during the digestion process is stored within the ESD, the sludge storage tank, and a dry seal gasholder. The gasholder is an enclosed vessel with an internal piston necessary to stabilize pressure in the gas delivery system. Gas from the gasholder passes through gas purifiers to remove H_2S prior to being piped to the combustion furnace or the hot water boiler. Excess unscrubbed digester gas that cannot be used by the combustion furnace or the hot water boiler is disposed of by burning in a separate 7.0 meter high waste gas burner (flare).

A 2.5 MMBtu/hr hot water boiler is used if necessary to maintain the proper operating temperature (approximately 95 deg F). The hot water boiler is served by its own 12.5 meter high stack.

Exhaust air from the combustion furnace is ducted to a water-supplied sub-cooler where a portion of it is returned to the combustion furnace as combustion air. The remainder of the cooled exhaust air passes through a wet venturi scrubber and then to a 2.0 MMBtu/hr regenerative thermal oxidizer (RTO) for final cleanup prior to exhausting through a 22.25 meter stack.

The drying and pelletizing systems are housed within a building maintained at a slight negative pressure and served by a building air chemical odor control scrubber which removes all odors prior to exhausting through the RTO stack cited above. A fugitive dust control system is also provided for the mixer, crusher-to-mixer and screen-to-silo bucket elevators, pellet cooler, and pneumatic conveyor. Outlet air from this dust collector moves to the RTO described above for final cleanup. A second fugitive dust control system treats air from the pellet silo, pellet oiling and truck load. The exhaust air from this system moves to the building air chemical odor control scrubber before exhausting through the RTO stack. The pellet oiling mixer also inhibits fugitive dust production.

Air Emissions from the Anaerobic Digestion System
The Egg-Shaped Digester (ESD) has two support systems that affect air emissions from the facility, 1) the hot water boiler and 2) the waste gas burner. The ESD will use the hot water boiler when needed to maintain proper operating temperature (approximately 95 deg F). The hot water boiler will be fired on either scrubbed digester gas or diesel fuel no. 2. No air emission controls are incorporated in the operation of the hot water boiler. The hot water boiler input rating is 2.5 MMBtu/hr. When required, the waste gas burner will burn excess unscrubbed digester gas. No emission controls are incorporated in the operation of the waste gas burner.

Air Emissions from the Heat Drying System
The heat drying process has two systems that affect air emissions from the facility, 1) the Andritz DDS-40 Drying System and 2) the building air chemical odor control scrubber.

Andritz DDS-40 Drying System
The proposed Andritz direct heat drying and pelletizing process dries the digested dewatered biosolids (cake) and converts them into dried, pelletized organic fertilizer. The process is essentially an evaporation of water from the cake. Hot air generated in the combustion furnace is mixed with the cake in the rotating triple pass drum to dry and pelletize the input material. The exhaust gas laden with dry pellets of various sizes undergoes several steps of treatment: i.e., separation of dried pellets and fine particulate matter from gas using air/solid separator and polycyclones; condensing evaporated water; recirculating a certain portion of exhaust gas back to combustion chamber; agglomerating remaining fine particulate in the venturi and removing them in the wet packed scrubber; and finally treating the cooled and clean gas in the Regenerative Thermal Oxidizer (RTO) for thermal destruction, oxidation and deodorization of noncondensible gaseous components. The combustion furnace and the RTO have 17.8 MMBtu/hr and 2 MMBtu/hr capacity, respectively.

Building Air Chemical Odor Control Scrubber

The facility building will be kept at slightly negative pressure. The building will be ventilated, and the exhaust will be treated by a dedicated chemical scrubbing system. There will be one chemical scrubber with two fans (one primary and one as backup). The scrubber system will be capable of providing 25,000 acfm. The scrubbing system will remove ammonia and hydrogen sulfide with high removal efficiency. The scrubber exhaust will be vented to the atmosphere along with the Andritz DDS-40 Drying System exhaust through a combined exhaust stack (ES#1).

Adequate air changes will be provided for various parts of the facility operational areas. The facility personnel area will be served by a separate HVAC system.

Air Emission Sources

The facility has three potential emission point sources: 1) Andritz DDS-40 Drying System and Building Air Chemical Odor Control Scrubber exhaust stack, 2) Hot Water Boiler, and 3) Waste Gas Burner.

Air Emission Source No. 1 (ES#1)

A single exhaust stack will be provided to release the combined flows and the controlled air emission from the Andritz DDS-40 Drying System and the chemical odor control scrubbing system for the facility building. The two fugitive dust control systems are also routed through this exhaust stack.

Air Emission Source No. 2 (ES#2)

A single exhaust stack will be provided to release exhaust from the facility's hot water boiler. The hot water generated by the boiler will be used to heat the facility's Egg-Shaped Digester (ESD). The hot water boiler operates intermittently as required for the anaerobic digestion controls. The hot water boiler will utilize a dual fuel burner. Its sources of fuel are scrubbed digester gas or diesel fuel no. 2.

Air Emission Source No. 3 (ES#3)

A waste digester gas burner (flare) will be used to burn the excess unscrubbed digester gas. The waste gas burner will operate intermittently as required.

Facility Fuels

The facility will utilize three different fuels for operation.

Digester Gas

Digester gas will be generated by the on-site anaerobic digestion system. Prior to being used as a fuel for drying or heating, the gas shall be scrubbed to remove hydrogen sulfide (H_2S). If the digester gas is not used as a fuel, excess gas will be flared prior to the hydrogen sulfide removal scrubber via the waste gas burner.

The scrubbed digester gas will be the primary fuel for use in the Andritz DDS-40 combustion furnace and the hot water boiler. The Andritz DDS-40 combustion furnace and hot water boiler will utilize dual fuel burners, and have the option to use digester gas and/or diesel fuel no. 2.

Diesel Fuel No. 2
Diesel fuel no. 2 is to be used only in the following equipment
a) Andritz DDS-40 Combustion Furnace (secondary fuel)
b) Andritz DDS-40 RTO
c) Hot water boiler (secondary fuel)

Propane
A small amount of propane will be used to operate the pilot lights of the following burners:
a) Andritz DDS-40 Combustion Furnace
b) Hot water boiler
c) Waste gas burner

Quantity and Composition of Fuels

Digester Gas
Digester gas is produced by the on-site anaerobic digestion system. Values indicated are estimates.

Gas Production, ft^3/day	190,000
High heat value, Btu/ft^3	550
Methane, ppmv	58-62
Carbon Dioxide, CO_2, ppmv	36-42
Moisture	Saturated
Hydrogen Sulfide, ppmv	3500-5000

Digester gas will be scrubbed prior to use as fuel for the combustion furnace and the hot water boiler. H_2S concentrations at the discharge of the scrubber will be no more than 500 ppmv.

Diesel Fuel No. 2
Diesel fuel no. 2 for use in the combustion furnace, RTO and the hot water boiler will be stored at the facility in an aboveground storage tank. The diesel fuel no. 2 used will meet the following specification:
Maximum sulfur content - 0.33% by weight

Hours of operation:
The anaerobic digester will be in operation continuously (24 hours/day, 365 days/year). The associated hot water boiler and waste gas burner will be operated automatically when required by the system.

The Andritz DDS-40 rotary drum dryer will be in operation for the time required to dry the Sand Island WWTP sludge. It is expected that the dryer will operate approximately three to five days per week. During dryer operation the combustion furnace and regenerative thermal oxidizer (RTO) will be in continuous operation.

The Dryer Facility Building will have a chemical odor scrubber treating building air continuously (24 hours/day, 365 days/year).

Air Pollution Control Equipment:

SO_2

The primary fuel for the Andritz DDS-40 Drying System and the hot water boiler is the digester gas which has been scrubbed to remove H_2S generated by anaerobic digestion thereby effectively eliminating SO_2 generation in the subsequent combustion process. In the event it becomes necessary to use the backup fuel, low sulfur diesel fuel no. 2 is used (sulfur content not to exceed 0.33% by weight). The regenerative thermal oxidizer (RTO) also fires low sulfur diesel fuel no. 2 as its primary fuel.

NO_x

Since the three emission sources all involve external combustion, NO_x generation is relatively low (as compared to internal compression ignition) and will be controlled by assuring proper maintenance and operation of the respective burners to minimize NO_x production. In the case of the largest source, i.e., the Andritz DDS-40 Drying System, exhaust gas cooling and recirculation will further inhibit NO_x production.

CO

All three external combustion sources firing gaseous or liquid hydrocarbon fuels (digester gas or diesel fuel no. 2) will be maintained and operated as designed in order to assure complete combustion and complete conversion of carbon to CO_2.

PM/PM_{10}

Two fugitive dust control systems will be provided for the pelletizing facility which itself is enclosed in a negative pressure building with all exhaust air being processed through a chemical scrubber. One fugitive dust control system is provided for the mixer, crusher-to-mixer and screen-to-silo bucket elevators, pellet cooler, and pneumatic conveyor. A second fugitive dust control system treats air from the pellet silo, pellet oiling and truck load. The exhaust air from one fugitive dust control system is polished by passage through the RTO, while the exhaust from the second fugitive dust control system is polished by passage through the Building Air Chemical Odor Control Scrubber.

Exhaust air from the Andritz DDS-40 drum dryer passes through a wet venturi scrubber and then the RTO before being released through a stack to the ambient air. A portion of the drum dryer exhaust is also cooled and recirculated to the Andritz DDS-40 combustion furnace. The hot water boiler firing either digester gas or diesel fuel no. 2 will control PM through proper maintenance and operation to assure complete combustion of all hydrocarbons to CO_2 and H_2O. PM control for the waste gas burner is accomplished by providing sufficient air to assure complete combustion of the hydrocarbons present in the unscrubbed digester gas.

VOC

All three external combustion sources firing gaseous or liquid hydrocarbon fuels (digester gas or diesel fuel no. 2) will be maintained and operated as designed in order to assure complete combusion and maximum conversion of carbon to CO_2 and hydrogen to H_2O.

H_2S
Since digester gas containing H_2S will be scrubbed in the gas purifiers prior to burning in the Andritz DDS-40 Drying System and hot water boiler, negligible emissions are expected. Smaller quantities of excess unscrubbed digester gas containing H_2S will be oxidized to SO_2 in the waste gas burner. Any hydrogen sulfide (H_2S) within the facility's building will be controlled by the Building Air Chemical Odor Control Scrubber. Removal efficiency was estimated to be 95%.

NH_3
Any ammonia (NH_3) within the facility's building will be controlled by the Building Air Chemical Odor Control Scrubber. Removal efficiency was estimated to be 99%.

Insignificant Activities:

None proposed.

Alternate Operating Scenarios:

None proposed.

Applicable Requirements:

Hawaii Administrative Rules (HAR)

Title 11, Chapter 59 — Ambient Air Quality Standards
Title 11, Chapter 60.1 — Air Pollution Control
- Subchapter 1 — General Requirements
- Subchapter 2 — General Prohibitions
  - HAR 11-60.1-31 — Applicability
  - HAR 11-60.1-32 — Visible Emissions
  - HAR 11-60.1-38 — Sulfur Oxides from Fuel Combustion
- Subchapter 5 — Covered Sources
- Subchapter 6 — Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
  - HAR 11-60.1-111 — Definitions
  - HAR 11-60.1-112 — General Fee Provisions for Covered Sources
  - HAR 11-60.1-113 — Application Fees for Covered Sources
  - HAR 11-60.1-114 — Annual Fees for Covered Sources
  - HAR 11-60.1-115 — Basis of Annual Fees for Covered Sources
- Subchapter 9 — Hazardous Air Pollution Sources

Federal Requirements
40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants (NESHAPS)
- Subpart A - General Provisions
- Subpart E - National Emission Standards for Mercury

Non-applicable Requirements:

Hawaii Administrative Rules

Title 11, Chapter 60.1	Air Pollution Control
Subchapter 7	Prevention of Significant Deterioration
Subchapter 8	Standards of Performance for Stationary Sources

Federal Requirements
40 CFR Part 52.21 - Prevention of Significant Deterioration of Air Quality
40 CFR Part 60 - New Source Performance Standards (NSPS)
40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories (Maximum Achievable Control Technologies (MACT) Standards)

Prevention of Significant Deterioration (PSD):

This source is not a major stationary source nor are there modifications proposed that constitute a major stationary source that is subject to PSD review, as defined in HAR §11-60.1-131, definition of a major stationary source. Therefore, PSD is not applicable.

Best Available Control Technology (BACT):

A Best Available Control Technology (BACT) analysis is required for new covered sources or significant modifications to covered sources that have the potential to cause a net increase in air pollutant emissions above significant levels as defined in HAR §11-60.1-1. The potential emissions from the combustion furnace, regenerative thermal oxidizer (RTO), chemical scrubber, hot water boiler and waste gas burner are shown below. The emissions were significant to trigger a BACT analysis for SO_2. BACT for the combustion furnace, regenerative thermal oxidizer (RTO) and hot water boiler for SO_2 emissions was determined to be low sulfur diesel fuel no. 2 (0.33% by weight).

Pollutant	**Potential Emissions (tpy)**	**Significant Level (tpy)**
NO_x	25.32	40
SO_2	**67.97**	40
CO	25.63	100
PM/PM_{10}	12.36	25/15
VOC	8.02	40
H_2S	0.394	10
Lead	8.61E-04	0.6

Consolidated Emissions Reporting Rule (CERR):

40 CFR Part 51, Subpart A - Emission Inventory Reporting Requirements, determines CER based on the emissions of criteria air pollutants from Type B point sources (as defined in 40 CFR Part 51, Subpart A), that emit at the CER triggering levels as shown in the table below.

Pollutant	Type B CER Triggering Levels [1] (tpy)	Pollutant	In-house Total Facility Triggering Levels [2] (tpy)	Total Facility Emissions (tpy)
NO_x	$\geq$100	NO_x	$\geq$25	55.12
SO_2	$\geq$100	SO_2	$\geq$25	77.38
CO	$\geq$1000	CO	$\geq$250	27.78
PM_{10}	$\geq$100	PM/PM_{10}	$\geq$25	3.76
VOC	$\geq$100	VOC	$\geq$25	8.64
Pb	$\geq$5	Pb	$\geq$25	1.03 E-03
		HAPS	$\geq$5	0.36

[1] Based on actual emissions
[2] Based on potential emissions

This facility does not emit at the CER triggering levels. Therefore, CER requirements are not applicable.

Although CER for the facility is not triggered, the Clean Air Branch requests annual emissions reporting from those facilities that have facility-wide emissions of a single air pollutant exceeding in-house triggering levels. Since the total emissions of NO_x and SO_2 within the facility are greater than 25 tons per year, annual emissions reporting for the facility will be required for in-house recordkeeping purposes.

Compliance Data System (CDS):

Applicable since this is a covered source.

Compliance Assurance Monitoring (CAM):

40 CFR Part 64

Applicability of the CAM rule is determined on a pollutant specific basis for each affected emission unit. Each determination is based upon a series of evaluation criteria. In order for a source to be subject to CAM, each source must:

- Be located at a major source per Title V of the Clean Air Act Amendments of 1990;
- Be subject to federally enforceable applicable requirements;
- Be fitted with an “active” air pollution control device;
- Have pre-control device potential emissions that exceed applicable major source thresholds; and
- Not be subject to certain regulations that specifically exempt it from CAM.

Emission units are any part or activity of a stationary source that emits or has the potential to emit any air pollutant.

This source is not subject to CAM because it is not considered a major source after the sludge incinerators are removed from the permit.

Synthetic Minor Source:

This source is a synthetic minor source as NO_x emissions are above major source levels without the operating restrictions on the Cleaver Brooks boilers (application no. 0216-05) and the 2,000 hp diesel engine effluent pumps (application no. 0216-05) and adding the emissions from the In-Vessel Bioconversion Facility (application no. 0216-07).

Pollutant	Cleaver Brooks Boilers (tpy)	2000 hp Effluent Diesel Engine Pumps (tpy)	In-Vessel Bioconversion Facility (tpy)	Total Emissions (tpy)
NO_x	5.26	158.84	25.32	189.42

Project Emissions:

In-Vessel Bioconversion Facility Emissions (Application No. 0216-07)

Pollutant	Combustion Furnace, RTO, Chemical Scrubber [1] (tpy)	Hot Water Boiler [1] (tpy)	Waste Gas Burner [1] (Flare) (tpy)	Total (tpy)
NO_x	21.5	2.4	1.42	25.32
CO	17.4	0.48	7.75	25.63
SO_2	32.5	4.07	31.4	67.97
PM/PM_{10}	2.37 [2]	0.17	0.66	3.20
VOC	5.04	0.05	2.93	8.02
H_2S	0.45	0	0.35	0.80
Formaldehyde	3.78E-02	4.77E-03		4.26E-02
Arsenic	1.29E-04	4.82E-05		1.77E-04
Beryllium	2.86E-04	3.61E-05		3.22E-04
Cadmium	1.15E-04	3.61E-05		1.51E-04
Chromium	2.86E-04	3.61E-05		3.22E-04
Lead	7.52E-04	1.09E-04		8.61E-04
Mercury	2.88E-01	3.61E-05		2.88E-01
Manganese	2.86E-04	3.61E-05		3.22E-04
Nickel	9.60E-04	3.61E-05		9.96E-04
Selenium	3.66E-04	1.81E-04		5.47E-04
Total HAPS	0.329	5.32E-03		3.34E-01

[1] Based on annual operations of 8760 hrs/yr
[2] Negligible amounts of PM/PM_{10} from the two fugitive dust control systems are also emitted at the RTO and Chemical Scrubber

Sand Island Wastewater Treatment Plant - Total Emissions

Pollutant	Application No. 0216-05[4] (tpy)	Application No. 0216-07 (tpy)	Application No. 0216-08[5] (tpy)	Total (tpy)
NO_x	29.8	25.32		55.12
CO	2.15	25.63		27.78
SO_2	9.41	67.97		77.38
PM/PM_{10}	0.56	3.20		3.76
VOC	0.62	8.02		8.64
H_2S	2.6[1,2]	0.80	6.4[3]	9.80
Total HAPS	2.23E-02	3.34E-01		0.36

[1] Does not include H_2S emissions from the Screenings Odor Control System as this system will be shutdown before the startup of the In-Vessel Bioconversion Facility.
[2] Headworks Odor Control System H_2S emissions at 3 ppmv not included.
[3] Headworks Odor Control System H_2S emissions at 7 ppmv.
[4] Application No. 0216-05 is the renewal application for the existing Sand Island WWTP.
[5] Application No. 0216-08 is a significant modification application for the Sand Island WWTP that increases the emission limit from 3 ppmv to 7 ppmv for the Headworks Odor Control System.

Air Quality Assessment:

The applicant conducted an ambient air quality impact analysis (AAQIA) for the proposed units of the In-Vessel Bioconversion Facility and also included the existing odor control systems, Cleaver Brooks boilers and the proposed 2000 hp effluent diesel engine pumps in the analysis from application no. 0216-03 (CSP No. 0216-04-C). This methodology was deemed acceptable in lieu of the lack of sufficient background H_2S data.

The ambient air quality impact analysis used the updated 2000 hp effluent diesel pump stack parameters from application no. 0216-05, the revised stack height for the Lo-Cat Odor Control System from application no. 0216-06, the revised stack height for the Headworks Odor Control System per the applicant’s August 12, 2003 letter, and the increase in Headworks Odor Control System H_2S emission limit (from 3 ppmv to 7 ppmv) from application no. 0216-08. The existing Sludge Incinerators Nos. 1 and 2 and Screenings Building Odor Control System were not included in the modeling as they will be permanently shutdown prior to the startup of the In-Vessel Bioconversion Facility as indicated in application nos. 0216-05 and 0216-07. In addition, in order to show compliance with the H_2S and SO_2 ambient air quality standards, additional changes were proposed in application nos. 0216-05 and 0216-07 and included in the ambient air quality impact analysis. They are as follows:

1. Revised the stack heights for the Lo-Cat and Clarifier Odor Control Systems to 18.29 meters (60 feet) and 17.37 meters (57 feet), respectively, to meet the H_2S ambient air quality standard; and

2. Revised the Cleaver Brooks Boilers Nos. 1 and 2 total combined annual fuel usage limitation from 525,600 gallons per any rolling twelve (12) month period to 260,000 gallons per any rolling twelve (12) month period to meet the SO_2 ambient air quality standard.

The applicant used the ISCST3 model as implemented in Bee-Line Software's BEEST System Ver. 7.10. to determine source compliance with the National and State Ambient Air Quality Standards (NAAQS/SAAQS). The modeling as well as the methodology and assumptions employed by the applicant have been determined to be acceptable and are discussed below.

The assumptions used in the ISCST3 modeling include the following:

a. Rural land use parameter
b. Ambient temperature of 298 K
c. Meteorological data
   5 years meteorological data from Honolulu Airport (1990-1991, 1993-1995). The 1992 data set was not utilized by the applicant due to excessive missing data.
d. Terrain
   The applicant utilized actual terrain heights at the selected receptor points from Hawaii USGS Digital Elevation Model (DEM) data, 7.5 minute maps.
e. Receptor locations
   Receptors were located in areas considered ambient air. Receptors were placed every 30 meters along the fenceline surrounding the property, with a fine receptor grid of 30 meter spacing. There were 1033 receptor locations in total.
f. Downwash
   The building downwash option was activated. The EPA Building Profile Input Program (BPIP) was used to derive the direction specific building dimensions for importing into the ISCST3 model. The program was used to determine the GEP stack height, analyze potential structure-induced downwash effects and calculate the building downwash parameters for ISCST3. All structures near the stacks that could cause downwash were assessed for downwash effects.
g. Background data
   The background data consisted of 2002 data from Kapolei (NO_x) and Honolulu (SO_2, CO, PM_{10}).
h. Separate ambient air quality modeling was performed for the equipment when fired on diesel fuel no. 2 and also digester gas.

Modeling Stack Parameters - Oil Fired

Source	**Pollutant**	**Emission Rates**	**Stack Parameters**				
Equipment		**(g/s)**	**Height (m)**	**Temp. (K)**	**Velocity (m/s)**	**Flow Rate (m^3/s)**	**Diameter (m)**
Combustion Furnace, RTO, Chemical Scrubber Stack	NO_x SO_2 CO PM_{10} H_2S	0.619 0.933 0.501 0.068 9.30 E-03	22.25	316	19.75	15.69	1.01
Hot Water Boiler	NO_x SO_2 CO PM_{10}	0.0693 0.11756 1.39 E-02 4.91 E-03	12.50	505	6.76	0.49	0.305
Waste Gas Burner (Flare)	NO_x SO_2 CO PM_{10} H_2S	4.16 E-02 0.903 0.223 1.89 E-02 1.01 E-02	7.01	866	1.98	0.47	0.549
Cleaver Brooks Boiler #1	NO_x SO_2 CO PM_{10}	0.1512 (S) 0.07479 (A)[1] 0.35426 (S) 0.17524 (A)[1] 0.0378 (S) 0.018698 (A)[1] 0.0081648 (S) 0.0040383 (A)[1]	14.0	466	9.25	1.22	0.41
Cleaver Brooks Boiler #2	NO_x SO_2 CO PM_{10}	0.1512 (S) 0.07479 (A)[1] 0.35426 (S) 0.17524 (A)[1] 0.0378 (S) 0.018698 (A)[1] 0.0081648 (S) 0.0040383 (A)[1]	14.0	466	9.25	1.22	0.41
2000 Bhp Diesel Engine Pump #1	NO_x SO_2 CO PM_{10}	4.57758 (S) 0.78383 (A)[2] 0.55692 (S) 0.09544 (A)[2] 0.252 (S) 0 (A) 0.0504 (S) 0.0086297 (A)[2]	18.29	793.15	51.77	5.14	0.3556
2000 Bhp Diesel Engine Pump #2	NO_x SO_2 CO PM_{10}	4.57758 (S) 0 (A) 0.55692 (S) 0 (A) 0.252 (S) 0 (A) 0.0504 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556

2000 Bhp Diesel Engine Pump #3	NO_x SO_2 CO PM_{10}	4.57758 (S) 0 (A) 0.55692 (S) 0 (A) 0.252 (S) 0 (A) 0.0504 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556
2000 Bhp Diesel Engine Pump #4	NO_x SO_2 CO PM_{10}	4.57758 (S) 0 (A) 0.55692 (S) 0 (A) 0.252 (S) 0 (A) 0.0504 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556
Headworks OCS #10	H_2S	0.18371	15.24	298.15	28.75	18.8779	0.9144
Lo-Cat OCS #11	H_2S	4.5234 E-02	18.29	298.15	16.53	10.85385	0.9144
Primary Clarifier OCS #9	H_2S	2.9484 E-02	17.37	298.15	17.82	7.07921	0.7112

[1] Based on two boilers with a total combined annual fuel consumption limit of 260,000 gallons/yr. Multiply short term concentrations by 260,000/525,600 = 0.495

[2] Based on four effluent diesel engine pumps with a total combined annual operation restriction of 1,500 hrs/yr. Multiply short term concentrations by 1,500/8,760 = 0.171

(S) short term averaging periods

(A) annual averaging periods

Modeling Stack Parameters - Digester Gas Fired

Source	**Pollutant**	**Emission Rates**	**Stack Parameters**				
Equipment		**(g/s)**	**Height (m)**	**Temp. (K)**	**Velocity (m/s)**	**Flow Rate (m^3/s)**	**Diameter (m)**
Combustion Furnace, RTO, Chemical Scrubber Stack	SO_2 H_2S	0.42 1.295 E-02	22.25	317	20.55	16.33	1.01
Hot Water Boiler	SO_2 H_2S	0.047 5.141E-04	12.50	477	6.99	0.51	0.305
Waste Gas Burner (Flare)	SO_2	0	7.01	866	1.98	0.47	0.549
Cleaver Brooks Boiler #1	SO_2	0.35426 (S) 0.17524 (A)[1]	14.0	466	9.25	1.22	0.41
Cleaver Brooks Boiler #2	SO_2	0.35426 (S) 0.17524 (A)[1]	14.0	466	9.25	1.22	0.41
2000 Bhp Diesel Engine Pump #1	SO_2	0.55692 (S) 0.09544 (A)[2]	18.29	793.15	51.77	5.14	0.3556
2000 Bhp Diesel Engine Pump #2	SO_2	0.55692 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556
2000 Bhp Diesel Engine Pump #3	SO_2	0.55692 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556
2000 Bhp Diesel Engine Pump #4	SO_2	0.55692 (S) 0 (A)	18.29	793.15	51.77	5.14	0.3556
Headworks OCS #10	H_2S	0.18371	15.24	298.15	28.75	18.8779	0.9144
Lo-Cat OCS #11	H_2S	4.5234 E-02	18.29	298.15	16.53	10.85385	0.9144
Primary Clarifier OCS #9	H_2S	2.9484 E-02	17.37	298.15	17.82	7.07921	0.7112

[1] Based on two boilers with a total combined annual fuel consumption limit of 260,000 gallons/yr. Multiply short term concentrations by 260,000/525,600 = 0.495

[2] Based on four effluent diesel engine pumps with a total combined annual operation restriction of 1,500 hrs/yr. Multiply short term concentrations by 1,500/8,760 = 0.171

(S) short term averaging periods

(A) annual averaging periods

Modeling Impacts - Oil Fired

Pollutant	Avg. Period	Maximum Concentration [1] (μg/m^3)
NOx	Annual	27.0 (1994)
SO_2	3-hr	696 (1995)
	24-hr	202 (1991)
	Annual	69.8 (1994)
CO	1-hr	328 (1991)
	8-hr	119 (1993)
PM_{10}	24-hr	13.8 (1993)
	Annual	3.04 (1994)
H_2S	1-hr	33.7 (1991)

[1] Results shown are the Highest, 1st High, except for H_2S which is the Highest 2nd High

Modeling Impacts - Digester Gas Fired

Pollutant	Avg. Period	Maximum Concentration [1] (μg/m^3)
SO_2	3-hr	270 (1995)
	24-hr	153 (1993)
	Annual	23.4 (1994)
H_2S	1-hr	33.7 (1991)

[1] Results shown are the Highest, 1st High, except for H_2S which is the Highest 2nd High

Predicted Ambient Air Impacts

Pollutant	Avg. Period	Maximum Concentration [1] ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	Total Concentration ($\mu g/m^3$)	SAAQS [2] ($\mu g/m^3$)	% of Std
NOx	Annual	27.0	9	36.0	70	51.43
SO_2	3-hr	696	30	726.0	1,300	55.85
	24-hr	202	9	211.0	365	57.81
	Annual	69.8	3	72.8	80	91.00
CO	1-hr	328	3,990	4,318	10,000	43.18
	8-hr	119	1,582	1,701	5,000	34.02
PM_{10}	24-hr	13.8	90.4	104.2	150	69.47
	Annual	3.04	15	18.04	50	36.08
H_2S	1-hr	33.7	0	33.7	35	96.3

[1] Maximum concentrations are the highest of the oil fired and digester gas fired modeling.
[2] Only the State Ambient Air Quality Standards (SAAQS) are shown as they are more restrictive than the National Ambient Air Quality Standards (NAAQS).

Significant Permit Conditions:

Significant permit conditions for the In-Vessel Bioconversion Facility included the following. Monitoring, recordkeeping and reporting conditions were included as applicable.

- The Andritz DDS-40 Drying System is subject to NESHAP, Subpart E - National Emission Standard for Mercury. Emissions are not to exceed 3200 grams of mercury per 24-hour period. An initial source performance test is required for mercury emissions.
- The diesel fuel no.2 fired in the combustion furnace, hot water boiler and regenerative thermal oxidizer (RTO) shall have a maximum sulfur content of 0.33% by weight.
- The scrubbed digester gas shall have a maximum H_2S concentration of 500 ppmv.
- The unscrubbed digester gas shall have a maximum H_2S concentration of 5000 ppmv.
- The maximum outlet concentration of H_2S and NH_3 from the Andritz DDS-40 Drying System shall be 0.61 ppmv and 50.3 ppmv, respectively.
- The Building Air Chemical Odor Control Scrubber and the Fugitive Dust Control Systems shall operate continuously when the Andritz DDS-40 Drying System is in operation.
- Visible emission requirements for the Andritz DDS-40 Drying System, hot water boiler and waste gas burner.
- Baghouse maintenance requirements for the Fugitive Dust Control System.
- The finished product shall not be stored outside of the two (2) pellet storage silos.
- Prior to the initial startup of the In-Vessel Bioconversion Facility, the permittee shall comply with the following:
  1. Raise the stack heights for the Lo-Cat and Clarifier Odor Control Systems to 18.29 meters (60 feet) and 17.37 meters (57 feet), respectively;
  2. The total combined fuel usage for the Cleaver Brooks Boilers Nos. 1 and 2 shall not exceed 260,000 gallons per any rolling twelve (12) month period; and
  3. The Sludge Incinerators Nos. 1 and 2 shall be permanently shutdown and removed from service.

Conclusion and Recommendations:

Recommend issuing the applicant a new covered source permit, CSP No. 0216-06-C, which would consist of the In-Vessel Bioconversion Facility's equipment in significant modification application no. 0216-07, subject to the significant permit conditions noted above. A 30-day public comment period and 45-day EPA review period are also required. The Sand Island WWTP would operate under two air permits, NSP No. 0216-05-N, which consists of the existing Cleaver Brooks boilers, effluent diesel engine pumps and odor control systems and CSP No. 0216-06-C, which consists of the In-Vessel Bioconversion Facility.

Reviewer: Darin Lum
Date: 7/04